

space agencies, and has held coordination meetings with Canada, China, Japan, and Russia. Such international consultation has been shown to be productive; for example, in April 1993, the Chinese Academy of Space Technology modified the upper stage of its Long March Launch Vehicle to prevent explosion in orbit and the subsequent creation of additional debris.

As well, in April 1993, NASA, ESA, and relevant space agencies in Japan and Russia established an informal, multilateral Inter-Agency Space Debris Coordination Committee (IADC). IADC members participate in specialized working groups on measurements, the debris environment, databases, and debris protection and mitigation, and as a body exchange information on debris research, recommend cooperative research projects, and identify and evaluate debris mitigation options.

II. Government-to-Government Contacts

At the June 1993 plenary session of the United Nations Committee on the Peaceful Uses of Outer Space (COPUOS), the U.S. joined a consensus decision to take up consideration of the orbital debris issue beginning at the February 1994 session of the COPUOS Scientific and Technical Subcommittee (STSC).

In its 1994 session, the STSC agreed on the importance of having a firm scientific and technical basis for any future action on the issue of debris. STSC members decided that they should first focus on understanding aspects of international research related to debris, including characterizing the debris environment; debris measurement techniques; mathematical modeling; and protective spacecraft design.

The 1995 session of the STSC addressed the subject of acquisition and understanding of data on the characteristics of the debris environment. STSC members and international organizations presented research results and provided information on practices proven effective in minimizing the creation of debris. The 1995 STSC session also adopted a multiyear work plan, through 1998, on the scientific and technical aspects of space debris.

The 1994 STSC session marked the first time that the scientific and technical aspects of the orbital debris issue were considered by a broad cross section of space and non-spacefaring governments. The STSC will provide a forum to increase overall awareness of the debris issue, to continue communication between the specialist research community and the STSC, and to present members with the results of U.S. research and international coordination on debris. Through the STSC, the U.S.

can help establish the necessary solid scientific and technical foundation upon which ongoing international cooperation can build.

III. Policy Objectives

The development of technical cooperation and consensus on the issue of orbital debris should be a prerequisite for discussion of any effective potential international agreements, regulatory regimes, or other measures—identified in the future—deemed appropriate to protect U.S. and other nations' space activities. In this regard, U.S. international activities dealing with debris should be guided by specific scientific, technical, and programmatic policy objectives.

In all international fora, the U.S. should continue to promote and contribute to an increased international understanding of the scientific and technical aspects of the generation, monitoring, and mitigation of debris. This will be particularly important in cases where the knowledge base of interested parties can be enhanced in order to encourage productive technical discussions.

The U.S. should continue to use every opportunity to encourage individual spacefaring nations to limit their generation of debris, since debris generated by other nations will eventually affect space assets belonging to the U.S. In the course of its international contacts on the issue of debris, whether through technical information exchange or government-to-government relations, the U.S. also will strive to ensure consistency in debris policies, standards, and practices among spacefaring nations and relevant international organizations.

To promote consistency in policy and practice, the U.S. should develop and maintain a common approach for achieving U.S. policy and program objectives in formal international organizations such as United Nations fora and in informal, technical, government agency-level multilateral groups such as the IADC.

In pursuing the goal of international cooperation, the U.S. Government should insure that any mitigation measures adopted are cost effective. At the same time we must carefully balance commercial and national security interests with the need to protect the space environment.

Success in the international management of the orbital environment will require an increased understanding on the part of all nations who now, or in the future, operate space systems. It is only through this understanding that consensus will emerge. The productive relationships that have already emerged make future prospects promising.

Chapter 8: International Cooperation

The 1989 Interagency “Report on Orbital Debris,” which this report updates, acknowledged the international importance of orbital debris. The report stated that the “causes and consequences of orbital debris are global in scope” and that “international cooperation is essential to a satisfactory solution.” One of the report’s recommendations was that

The U.S. should inform other spacefaring nations about the conclusions of this report and seek to evaluate the level of understanding and concern of other nations and relevant international organizations about orbital debris issues. Where appropriate, the U.S. should enter into discussions with other nations to coordinate minimization policies and practices.

Since 1989, the U.S. and a number of foreign governments and international spacefaring organizations independently have addressed issues of orbital debris, including procedures for the disposal of satellites—at the end of their operational life—in geosynchronous orbit.

For example, the INTELSAT, TELESAT (Canada), INMARSAT and EUTELSAT communications satellite organizations, and the Indian Space Research Organization adopted policies early requiring their future geostationary satellites to be boosted into higher orbits at the end of operational life, and all now have done so, but not to a particular separation requirement above the geosynchronous arc. Russia has adopted a policy of reboosting its satellites to 200 km, and in many instances reboosts to even higher orbits. NASDA requires that its satellites be reboosted to not less than 150 km and advocates 500 km as a desirable goal. ESA and NASA have adopted a reboost standard of 300 km. Based on these institutional practices, the International Telecommunications Union recommended in May 1992 that all operators of geostationary satellites boost spacecraft to 300 km above the geosynchronous arc and make the spacecraft inert at the end of operations.

Nevertheless, the number of nations and organizations who utilize space has grown rapidly, and their varied and expanded activities have implications for the debris environment. By its very nature, orbital debris is now a global space environment issue, and individual national debris

research and practice must be supplemented with coordinated international activity. More than ever, it is clear that close international cooperation is necessary for dealing effectively with orbital debris.

The U.S. and other spacefaring nations and organizations together are taking steps to monitor the space environment and manage data and information on debris, minimize its generation, and implement measures to survive contact with debris in space. As a result of this international cooperation, individual efforts in debris research are enhanced through technical coordination and consensus, and are leading to a better understanding of debris and its implications for the utilization of outer space.

The U.S. has taken the lead in the international consideration of orbital debris issues through technical agency and government-to-government contacts. Continuing U.S. participation in the international dialogue on debris should continue to be governed by consideration of U.S. commercial, scientific, civil operational, and national security interests.

I. Technical Agency Information Exchange

In the interest of achieving a technical consensus on all facets of the orbital debris issue, the U.S. has conducted extensive research in characterizing the debris environment and is sharing the results of its studies with the international community.

Discussions on the debris issue have been taking place at one level or another among international space agency scientists, engineers, and managers for almost a decade. These discussions have occurred at technical society conventions and in regularly scheduled bilateral and multilateral meetings.

NASA began to exchange information on space debris issues with ESA in 1987, and has met with ESA on a biannual basis since 1989. Discussions at these meetings have focused on debris research and modeling, and have led to an arrangement to share debris tracking data, environmental models, and explosion and hypervelocity test results. In August of 1992, the two agencies finalized a letter agreement documenting their common interest in continuing joint efforts.

NASA also has signed letter agreements on technical coordination with the French and German



During the STS-61 Hubble Space Telescope (HST) repair mission, the astronauts observed a large hole measuring ~1.9 cm by ~1.7 cm in one of the HST's two high-gain antenna (HGA) dishes. The HGA dishes are ~1 cm thick honeycomb core composites with graphite-epoxy facesheets. The rough edges of the hole in the HGA is typical of impact damage in graphite-epoxy.



Part Three:

International Activities, Legal Issues, and Regulation